

## ABSTRACT OF THE DISCLOSURE

[0071] A non-contact imaging apparatus for examining an object having complex surfaces or shape deformations. The imaging apparatus includes at least one imaging device for obtaining a scanned image of the exterior surfaces of the object being examined. A predetermined reference image) of an ideal model for the object is stored in a memory. An image register is coupled to the imaging device and to the memory containing the reference image of the ideal model for the object. A transformation estimator compares the scanned image to the reference image and provides a transform which maps the scanned image to the reference image and provides a set of registered object data points. One or more filter modules process the registered object data points with a priori information to reduce noise and to further enhance the accuracy and precision of the registration. A gauge estimator is coupled to the filter module. The gauge estimator utilizes the processed and registered object data to determine deformation parameters of the object, which are then displayed to an operator as gauging information.